3D Photography, CAD/CAM Make Sculptor's Work Live Larger

When Milwaukee sculptor Frank Savage was asked to recreate one of his most elaborate pieces at four times the original size, he had a dilemma – how to increase size without losing design integrity.

Savage, an industrial designer for Harley-Davidson Motorcycles by trade, turned to Advanced Design Concepts (ADC), a 3D modeling and CAD service bureau, to help him come up with a solution.

ADC combined a process called 3D photography with traditional CAD/CAM to provide an exact 3D model of the sculpture, which Savage can use to make larger replicas.

Keeper of the Flame

"Flame" is a limited-edition sculpture Savage is selling at art shows and on a website called www.infiniteperspectives.com. The original piece is 10 inches tall and is made of cast aluminum and stone.

"The 2D sketch of the sculpture was somewhat inspired by modern day tattoo art and also by fire itself," Savage says.

To create an original, Savage starts with a 2D sketch, then sculpts a model with aluminum rod and casting resin. The model is used as a pattern for a sand-cast mold. Molten aluminum is then poured into the mold. The hardened aluminum is sanded and buffed by hand, then secured to its stone base.

It takes weeks for Savage to make a new sculpture, and it would take even longer to make a larger one that maintains the accuracy of an original.

"I turned to ADC to help me reproduce the original idea on a much larger scale because they had the technology to make an exact 3D replica of the piece," Savage says.

Detailing Sharp Edges

Savage gave Senior Designer Greg Groth of ADC an original version of his Flame sculpture. Groth scanned it with a Perceptron ScanWorks system. The resulting point cloud data was brought into Geomagic Studio software from Raindrop Geomagic (www.geomagic.com).

Geomagic Studio is used for 3D photography, the process of automatically capturing a physical object and turning it into a digital model for design, engineering, mass

customization and web-based marketing applications. The software enabled Groth to seamlessly reproduce the intricacies of Savage's sculpture.

"These types of models are extremely difficult," Groth says. "There are so many complex surfaces and rounded edges. One issue with the point cloud data on this sculpture is keeping the tips of each flame sharp once the file is polygonized. Geomagic Studio allowed me to recreate those sharp features to maintain the integrity of the model."

Once the polygon mesh was created in Geomagic Studio, the IGES file was uploaded into Pro/ENGINEER CAD/CAM software to create the final model.

This entire process took Groth about eight and a half hours. He estimates it would have taken 35 to 40 hours without the 3D photography process.

"To maintain accuracy for objects like this sculpture without the 3D photography process would be quite time consuming," Groth says. "Geomagic Studio allows the user to overlay a highly accurate, tangent surface structure. The surface structure maintains the detail of the entire model."

Savage delivered the 3D file to a machine tooling company, which will use it to generate a toolpath from which a pattern can be cut. The pattern will then be used to create molds for casting the sculpture in aluminum.

From the Studio to the Living Room

ADC's process is giving Savage the ability to deliver an authentic Flame sculpture at any size his customer's desire, without compromising the integrity of the design.

"Some of my pieces are rooted in machine art and pure form while others explore my emotions," says Savage. "Regardless of size, it's important that each buyer takes a unique piece from my studio to their living room."

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